

(54) INDUSTRIAL CARTRIDGE

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(57) Claim

1. Industrial cartridge with a casing containing a propellant charge, a base piece and arranged axially in the casing, an ignition guide tube which is connected to the base piece along with an igniter therearranged, characterised by the following features:

- a) The propellant charge is composed of at least two propellant charge powders (2,3) burning with different speeds, arranged one after the other, which are separated from one another by a gas permeable covering (7) extending across towards the casing axis;
- b) The ignition guide tube (5) possesses, provided at the level of the second or last propellant charge powder (2) away from the base piece, a covering (10) which is thinner than the wall (11) of the ignition guide tube;
- c) The casing (9) contains at its end disposed opposite to the base piece (1) a closure (6) of a compressible material.

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Troisdorf, the 05.08.1983

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INDUSTRIAL CARTRIDGE

The invention relates to an industrial cartridge according to the preamble to claim 1.

It is known to break up or breach natural rock, concrete, masonry and the like from a drilled hole with a specific depth and a specific diameter by means of an explosive cartridge or a special apparatus with propellant cartridges. In German Patent Specification 1 195 696 is described an arrangement for shot firing. Whereas with use of explosive cartridges there takes place after the ignition detonation, propellant cartridges contain a propellant charge which burns away comparatively slowly (deflagration). Explosive cartridges are usually employed in the region of the lower third of the drilled bore, preferably at or near the deepest position of the drilled bore, and ignited. A commercially available propellant cartridge-containing special apparatus is the so called ROCK-BREAKER of the Company H.Jurgen Essig Berlin. After insertion of the explosive cartridge or the special apparatus with propellant cartridge, in addition, the drilled hole can be filled with water as damming or tamping. The water serves, inter alia, for transmission of the pressure of the combustion gases at the drilled hole wall and the deepest part of the drilled hole. In the case of the ROCK-BREAKER, the pressure existing after ignition of an industrial cartridge used in the apparatus transmitted by means of an impulse tube with radial openings to the water filling up the drilled bore. The hydrodynamic impulse effects the desired splitting for example of stone or concrete. The indicated apparatus possesses below the impulse tube in the working position a

1 cylindrically shaped rubber sleeve which is expanded through radial bores in the tube wall after ignition of the cartridge and achieves thereby a stabilisation of the apparatus in the drilled hole.

5 When employing explosive cartridges, extensive safety measures must be taken. The handling of the cartridges must take place by a man skilled in the art with corresponding training.

The apparatus working with explosive for
10 cartridges, such as the indicated ROCK-BREAKER can, in contrast to the use of explosive cartridges, be driven with a smaller safety requirement.

The cartridges used for this are usually so formed that, after ignition of the propellant charge, they yield
15 a gas pressure impulse of short duration. With such cartridges, however, even with use of suitable apparatus, lumps of rock and stone and the like are only reduced with difficulties, if these objects, for example stones, are large and/or possess a high strength. Therefore,
20 the maximum size of material to be split with the ROCK-BREAKER along the edges at the surface containing the upper edge of the drilled hole is limited to about 40 to 50 cm, or cubes of between 1 and 1.2 m³. With a size of more than 1.2 m³, a plurality of drilled holes must be
25 used. These difficulties can also not be reduced by employment of a cartridge with a large propellant charge, since in this case the gas pressure is merely increased in the drill hole, to escape without effect through fissures adjacent the bore in the material to be split
30 and not to achieve an enlarging of the split existing in the material after ignition of the propellant charge.

The invention is based on the object of fragmenting natural rock, concrete, masonry and the like more effectively than with the known means.

35 This object is solved by an industrial cartridge with the features set out in the characterising part of claim 1.

1 The industrial cartridge according to the
invention contains a propellant charge of at least two
propellant charge powders arranged one after the other
burning with different speed. In this way the result is
5 achieved that the cartridge yields, after giving off the
main pressure impulse at least a further gas pressure
impulse, whereby the material already containing a split
is broken down completely. The cartridge according to
the invention possesses a further advantage in that the
10 propellant charge contained in it can be formed according
to the requirements for matching of the charge strength
to the material to be split. In this way, the risk of
hitting or flying stone as a consequence of too great a
charge is reduced. Furthermore, there is the improved
15 possibility of measuring of the propellant charge or its
strength for the splitting of valuable material, for
example in breaking marble where it is of advantage to
keep the stressing of the material as low as possible.

In a more advantage embodiment of the industrial
20 cartridge according to claim 2, there are present two of
these propellant charge powders which burn with different
speeds. This is achieved by the selection of the
powders. According to claim 3, the cartridge can also
contain propellant charge powders of different
25 granularity. This makes it possible to fix or influence
the speed of combustion of the powder. The formation of
the industrial cartridge according to claim 4 is a
preferred solution with which a sequential burning off of
the propellant charge powders is achieved especially
30 simply in the desired sequence.

In the embodiment according to claim 5, there is
claimed the most suitable formation of the closure of the
casing. As a result of the high compressibility of the
closure material, it is achieved that the propellant
35 charge powder located thereunder only burns off
completely before the gas yielded thereby can escape.

The industrial cartridge according to the

1 invention can be used in different apparatuses for
different areas of industry. Thus for example, the
removal of slag residues in the metallurgical industry is
possible with the aid of the cartridges.

5 The invention is described further hereinafter
with reference to a constructional example shown in the
drawing.

The Figure shows an industrial cartridge in
longitudinal section. The casing 9 with the base piece
10 1 contains the propellant charge powders 2,3. Casing and
base piece consist for example of aluminium, brass or a
plastics, such as for example polyethylene. They can be
formed in one or two pieces. The propellant charge
powders 2,3 are advantageously nitrocellulose powders
15 which optionally contain nitroglycerine. They differ in
their rates of combustion. Preferably, the propellant
charge powder 2 burns away more rapidly than the
propellant charge powder 3. The more rapidly burning
powder requires, in contrast to substances employed as
20 explosives, approximately ten times the time for
combustion. The slower burning powder requires, in
contrast to that burning more rapidly approximately
double the time for the combustion. The different
burning speed for the propellant charge powder is
25 obtained in known manner by different composition and/or
granularity of the powders.

The propellant charge powder 3 is ignited later
than the propellant charge powder 2. The difference
amounts to to 1/100 seconds. What is achieved thereby
30 is that the propellant charge powder 2 is ignited by the
ignition gases of a mechanically or electrically released
charge 4 directly over an ignition guide tube 5 axially
arranged open at the end turned away from the base piece
1, which is provided with the closure 10 and optionally
35 in the region of the propellant charge powder 2 with
radially arranged ignition openings. Ignition guide tube
5 and closure 10 can also be formed in one piece, for

1 example in one procedure, injection moulded from a
plastic. The closure 10 is thinner than the wall of the
ignition guide tube. Preferably the closure 10 consists
of a foil of about 0.2 mm thickness. The propellant
5 charge powder 3 is secondarily ignited by the flame
existing after ignition of the propellant charge powder
2.

The propellant charge powders 2,3 are separated
from one another by a gas permeable covering 7 extending
10 across the casing. The gas permeable covering 7
consists for example of felt, fabric, foam or discs of
metal - e.g. aluminium - or plastic provided with braking
positions. The gas permeable covering 7 is held by a
cup-shaped member 12 which consists preferably of a
15 plastic, such as for example polyethylene. The casing 9
contains a compressible closure 6 at its end opposite the
base piece 1. The closure 6 is appropriately held by a
disc 13 on the inner casing 14. It can however also be
held otherwise for example by internal projections on the
20 casing 9. The closure 6 consists for example of
filamentary felt, and a disc 13 and inner casing 14 of
polyethylene. The closure 6 is held on the end of the
casing 9 opposite the base piece 1 by a further disc 15
which consists likewise preferably of polyethylene. The
25 closure 6 is compressible to 25 to 30% of its original
volume. The compression takes place by the gases
existing after the ignition of the propellant charge
powder 2. Within the compression time lasting only micro
seconds, the propellant charge powder 2 burns up
30 completely. Then the closure 6 and the discs 13,15 are
broken up by the increased gas pressure or flung out of
the casing 9, and the gas yielded flows out.

The cartridge according to the invention is
provided with a casing edge 8 in such a manner that the
35 cartridge cannot be used in the usual commercial weapons
such as for example signal pistols.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Industrial cartridge with a casing containing
5 a propellant charge, a base piece and arranged axially in
the casing, an ignition guide tube which is connected to
the base piece along with an igniter therearranged,
characterised by the following features:

a) The propellant charge is composed of at least two
10 propellant charge powders (2,3) burning with
different speeds, arranged one after the other,
which are separated from one another by a gas
permeable covering (7) extending across towards
the casing axis;

15 b) The ignition guide tube (5) possesses, provided
at the level of the second or last propellant
charge powder (2) away from the base piece, a
covering (10) which is thinner than the wall (11)
of the ignition guide tube;

20 c) The casing (9) contains at its end disposed
opposite to the base piece (1) a closure (6) of a
compressible material.

2. Industrial cartridge according to claim 1,
characterised in that the casing (9) contains two
25 propellant charge powders (2,3) arranged one after the
other, with the propellant charge powder (2) located at
the level of the covering (10) of the ignition guide tube
(5) burning more rapidly than the other propellant charge
powder (3).

30 3. Industrial cartridge according to claims 1 or
2, characterised in that the propellant charge powders
(2,3) possess different granularities.

4. Industrial cartridge according to one of
claims 1 to 3, characterised in that the covering (10) of
35 the ignition guide tube (10) consists of a foil of about
0.2 mm thickness.

1 5. Industrial cartridge according to one of
claims 1 to 4, characterised in that the closure (6) of
the casing (9) is compressible to 25 to 30% of its
original volume.

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DATED THIS 21ST DAY OF SEPTEMBER, 1984.

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By Its Patent Attorneys:

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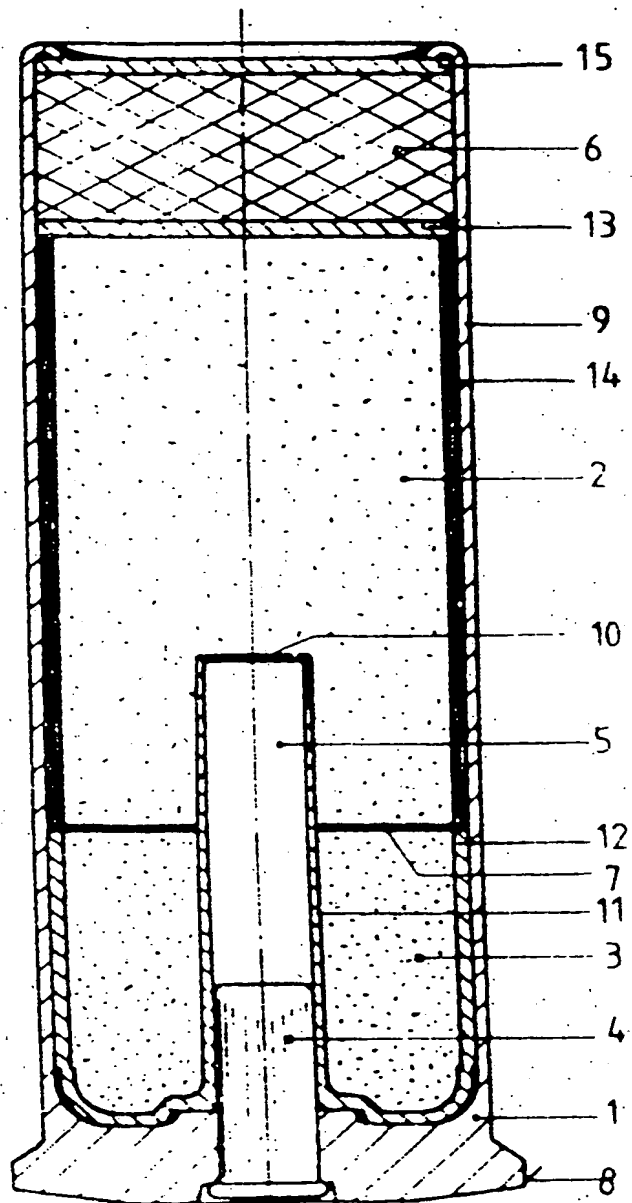
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